YEAR OF CLEAN WATER

Water Education Weekly Drops

Week Eight

Underground Injection Control Program

The Underground Injection Control (UIC) Program is a regulatory program under the authority of the Safe Drinking Water Act. The UIC Program seeks to protect underground sources of drinking water (USDW) from the subsurface emplacement of fluids through injection wells. The UIC Program can be administered by a State, known as primacy implementation, or can be directly implemented by EPA. In EPA Region 3, Maryland, Delaware and West Virginia are Primacy States and EPA implements the program in the Commonwealths of Pennsylvania and Virginia as well as the District of Columbia.

Years ago, one of the major discharges to streams and rivers in Pennsylvania was brine, a byproduct of oil and gas production. The produced brine has an extremely high chloride concentration (typically as high as 100,000 mg/l) and other heavy metal and organic constituents which can have deleterious effects on human health and the environment. When EPA cracked down on brine discharges in the early to mid 1980's, basically eliminating the use of NPDES permits under the Clean Water Act, the UIC Program came to the rescue of the environment and many oil and gas operators by providing an alternative, but regulated, disposal methodology for the brine. Operators now use injection wells to inject the brine back into the geologic formations from where the brine was originally produced, either to enhance their oil production or for disposal purposes.

The UIC Program specifically regulates the protection of ground water as a resource. The regulations have the capability to protect public, private, and presently unused but potential ground water supplies from injected fluids.

Questions:

1. What is an underground source of drinking water (USDW) as defined by

the UIC regulations?

2. How many different classes of wells does the UIC Program regulate, and what kinds of wells are in each classification?

3. How did the knowledge that you could inject fluids underground get its start?

4. What event, which occurred in Pennsylvania, helped to commence the regulatory process for the development of the UIC Program?

Answers:

1. What is an underground source of drinking water (USDW) as defined by the UIC regulations?

A. An underground source of drinking water or USDW is an aquifer, or part of an aquifer system, capable of yielding a sufficient amount of ground water to supply a public water system; and (a) currently supplies drinking water for human consumption; or (b) contains less than 10,000 mg/l total dissolved solids and is not an exempted aquifer. (UIC Program Guidance defines sufficient as 1 gallon/minute sustained yield.)

2. How many different classes of wells does the UIC Program regulate, and what kinds of wells are in each classification?

A. There are five classes of injection wells regulated by the UIC Program. **Class I** regulates industrial and municipal injection wells that inject below the lowermost USDW. **Class II** regulates fluids which are brought to the surface in connection with conventional oil and gas production. **Class III** regulates the injection of fluids for the extraction of minerals, such as the mining of sulfur or the solution mining of salt. **Class IV** regulates the disposal of hazardous or radioactive waste into or above the lowermost USDW. **All Class IV wells are banned**, although EPA from time to time discovers the existence of one of these shallow wells and takes appropriate enforcement action. **Class V** regulates **all other wells** not included in the first four classifications. Most of these wells are shallow wells which inject directly into USDWs. Class V wells include the largest inventory of injection wells. This class includes wells like automotive waste disposal wells and cesspools, which have been banned in wellhead protection areas, as well as beneficial use wells such as those used for aquifer recharge and subsidence control.

3. How did the knowledge that you could inject fluids underground get its

start?

A. Actually, it started by accident. Oil production operators started to notice that their production wells, after declining in production, began to increase. They came to realize that other wells, which had been abandoned in the field, were allowing fresh water from aquifers up-hole to flow down into the oil producing formations, thereby increasing production. This uncontrolled "dump flooding" as it was called, was the beginning of what we today call, "enhanced recovery", a regulated practice under the UIC Program. It also made other industries aware that they could also dispose of their waste byproducts through underground injection.

4. What event, which occurred in Pennsylvania, helped to start the regulatory process for the development of the UIC Program?

A.During the 1960's, Hammermill Paper Company, in Erie, Pennsylvania, operated several deep injection wells to dispose of their waste byproducts from paper manufacturing. This practice was unregulated by the Commonwealth and Federal Government at the time and, therefore, there were no controls in place for this practice. Hammermill operated these wells under a very high rate of injection as well as a very high injection pressure. As a result of this uncontrolled injection practice, the formation reached the point where it could no longer accept any more fluid and exploded at the surface, throwing geysers of injected waste back onto the land surface for weeks until the pressure in the formation stabilized. Some time after this event, fluid was discovered flowing from an old unplugged oil and gas well on Presque Isle and was traced back to Hammermill. Fluid had migrated a distance of about seven miles, underground, due to the intense pressure and volume of fluid injected. This catastrophe, as well as a few others around the country, prompted the beginning of the development of the UIC regulations.

To learn more about the UIC Program, go to the Region III website:
www.epa.gov/reg3wapd/uic/index.html
or
the national website located at: www.epa.gov/ogwdw/uic.html,
or contact:
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